Date: July 16, 1997

Subject: Revised Impacts of the Regulatory Options for New and Existing Medical Waste

Incinerators (MWI's)

EPA Contract No. 68-D6-0012; Task Order No. 0001

MRI Project No. 4800-01

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I. Introduction

The Environmental Protection Agency (EPA) has evaluated several regulatory options for the new source performance standards (NSPS) and emission guidelines (EG) for new and existing medical waste incinerators (MWI's). The air, cost, solid waste, wastewater, and energy impacts of each of the regulatory options were presented in a supplemental <u>Federal Register</u> notice on June 20, 1996.¹

During the public comment period following the supplemental notice, several commenters stated that the costs for emissions monitoring used in the development of the cost impacts were inaccurate. As a result, the monitoring costs as well as the options for emissions testing and monitoring under consideration for the MWI regulations have been revised.² The costs of emissions testing and monitoring affect the costs associated with the MWI regulation, which in turn affect the estimates of the air, solid waste, wastewater, and energy impacts of the regulation. Therefore, the impacts associated with the MWI standards and guidelines have been updated. In addition, the annual cost associated with the MWI operator training and qualification requirements has been included in the cost impacts.³

The purpose of this memorandum is to present the revised impacts associated with each of the regulatory options under consideration for the NSPS and EG. The various regulatory options and scenarios for new and existing MWI's are discussed in Section II of this memorandum. The methodology used to develop the revised impacts associated with each regulatory option is discussed in Section III and the results of the impact analyses are presented in Section IV.

II. Regulatory Options

Six regulatory options were considered for the EG for existing MWI's and three regulatory options were considered for the NSPS for new MWI's. These regulatory options are presented below for three sizes of MWI's. Small MWI's have waste charging capacities of less than or equal to 200 pounds per hour (lb/hr). Medium MWI's have charging capacities of greater than 200 to 500 lb/hr, and large MWI's have charging capacities of over 500 lb/hr.

A. Regulatory Options for Existing MWI's

- 1. Option 1: good combustion on small; moderate efficiency wet scrubber on medium; and high efficiency wet scrubber on large MWI's.
- 2. Option 2: good combustion on small located more than 50 miles from a standard metropolitan statistical area (SMSA) and burning less than 2,000 lb/wk; low efficiency wet scrubber on all other small; moderate efficiency wet scrubber on large MWI's.
- 3. Option 3: low efficiency wet scrubber on small; moderate efficiency wet scrubber on medium; high efficiency wet scrubber on large MWI's.
- 4. Option 4: moderate efficiency wet scrubber on small; moderate efficiency wet scrubber on medium; and high efficiency wet scrubber on large MWI's.
- 5. Option 5: moderate efficiency wet scrubber on small; high efficiency wet scrubber on medium; and high efficiency wet scrubber on large MWI's.
- 6. Option 6: high efficiency wet scrubber on small; high efficiency wet scrubber on medium; and high efficiency wet scrubber on large MWI's.

B. Regulatory Options for New MWI's

- 1. Option 1: moderate efficiency wet scrubber on small; high efficiency wet scrubber and dry injection fabric filter system on medium; and high efficiency wet scrubber and dry injection fabric filter system with carbon on large MWI's.
- 2. Option 2: moderate efficiency wet scrubber on small; high efficiency wet scrubber and dry injection fabric filter system with carbon on medium; and high efficiency wet scrubber and dry injection fabric filter system with carbon on large MWI's.
- 3. Option 3: high efficiency wet scrubber on small; high efficiency wet scrubber and dry injection fabric filter system with carbon on medium; and high efficiency wet scrubber and dry injection fabric filter system with carbon on large MWI's.

C. Switching Scenarios

The term "switching" refers to a healthcare facility discontinuing the use of their MWI and choosing a different method of waste disposal (e.g., contract disposal with a commercial medical waste hauler or onsite treatment with an autoclave, microwave, chemical treatment system, etc.) Three "switching" scenarios were explored under each of the regulatory options for new and existing MWI's to reflect a range of impacts that might result from each regulatory option. The three scenarios considered within each regulatory option are Scenario A (no switching), Scenario B (switching/waste segregation), and Scenario C (switching/no waste segregation). Waste segregation refers to the separation of the infectious waste stream from the noninfectious waste stream prior to disposal.

Scenario A is an unlikely result of the MWI regulation because alternatives to onsite incineration are widely available and are often less expensive than adding an air pollution control device to an MWI. Scenarios B and C reflect different levels of switching and represent the likely range of impacts associated with the MWI regulations. Scenarios A, B, and C are discussed further in a separate memorandum.⁴

III. Methodology Used to Estimate the Impacts

A. Existing MWI's

The final guidelines may allow MWI's to change their size designation through a Federally enforceable limit on waste charge rate. As a result, it was assumed under regulatory option 1 that a number of facilities operating medium MWI's may derate their MWI capacity to small in order to meet emission limits achievable with good combustion alone. Therefore, when calculating the impacts of regulatory option 1, it was assumed that all small and medium MWI's would meet emission limits achievable with good combustion alone.

Due to lack of cost-effective alternatives to onsite incineration, facilities operating small existing MWI's in remote or rural locations may be faced with financial hardship if the guidelines for small MWI's are based on wet scrubbers. Therefore, one option for the final guidelines is to allow small MWI's that meet certain "rural criteria" to meet emission limits achievable with good combustion alone while all other small MWI's meet emission limits achievable with low efficiency wet scrubbers. Prior to the supplemental notice, regulatory option 2 was used to calculate the impacts if all small MWI's located outside of SMSA's were allowed to meet emission limits achievable with good combustion alone. Following the supplemental notice, the rural criteria was refined to include only those small existing MWI's that are located more than 50 miles from an SMSA and burn less than 2,000 pounds of waste per week. Only 114 small existing MWI's meet this rural criteria. When calculating the revised impacts of regulatory option 2, only those small existing MWI's that meet the rural criteria were assumed to meet emission limits achievable with good combustion alone.

Taking into account the assumptions regarding regulatory options 1 and 2 described above, the same methodology used to develop previous estimates of the impacts of the EG was used to

develop the revised estimates of the impacts. This methodology is documented in three separate memoranda. Changes to the previous impact estimates for existing MWI's include the use of revised monitoring costs and the addition of operator training costs. Table 1 presents the revised annual and capital monitoring costs associated with each level of emissions control. A discussion of the revisions to the monitoring costs and revisions to the testing and monitoring options is presented in a separate memorandum. The annual cost for operator training is expected to be approximately \$364 per year. No capital cost was associated with the operator training requirements.

When determining the revised cost impacts of the EG, the increase in the annual and capital costs associated with the EG was evaluated for each existing MWI under each regulatory option. The cost increase associated with the EG includes the annual and capital costs of control, testing and monitoring, and operator training. Because the costs associated with the EG have been revised, the switching analysis has been updated based on the new costs.

For each onsite MWI under switching scenarios B and C, the annual control, monitoring, and operator training costs associated with complying with the guidelines were compared to the annual commercial disposal costs. In cases where the annual control, monitoring, and operator training costs exceeded the annual commercial disposal costs, it was assumed that the owner of the MWI would switch to commercial disposal (or commercial disposal and landfilling under scenario B). For facilities that switch under scenarios B and C, the cost impacts of the EG were assumed to be the annual costs associated with commercial disposal (or commercial disposal and landfilling under scenario B).

Commercial MWI's were not subjected to the switching analyses under scenarios B and C because switching to an alternative method of waste disposal (i.e., commercial disposal) is not a feasible option for facilities operating commercial MWI's. It was assumed that existing commercial facilities would install the controls necessary to meet the EG. Also, the switching analysis was not conducted for small existing MWI's that meet the rural criteria because these MWI's were assumed to have no cost-effective alternatives to onsite incineration. Small MWI's that meet the rural criteria were assumed to install the controls necessary to meet the emission limits under each regulatory option.

Once the switching analysis was revised for each existing MWI under each of the regulatory options and scenarios, the air, solid waste, wastewater, and energy impacts of the EG were updated based on the new switching analysis. The same methodology used to incorporate switching into previous analyses of the air, solid waste, wastewater, and energy impacts of the EG was used for the revised impacts. This methodology is documented in two separate memoranda.^{7,8}.

B. New MWI's

The same methodology used to develop previous estimates of the impacts of the NSPS was used to develop the revised estimates of the impacts. This methodology is documented in three separate memoranda. 6-8 Changes to the previous impact estimates for new MWI's include: (1) the use of revised testing and monitoring costs in place of the old testing and monitoring costs; (2) the

addition of operator training costs; and (3) the use of hazardous waste disposal costs in place of municipal waste disposal costs for flyash disposal. The revised annual and capital monitoring costs associated with each level of emissions control are presented in Table 1. A discussion of the revisions to the monitoring costs and revisions to the testing and monitoring options is presented in a separate memorandum.² The annual cost for operator training is expected to be approximately \$364 per year.³ No capital cost was associated with the operator training requirements.

In the previous cost estimates, the cost of flyash disposal as municipal waste (approximately \$40 per ton) was included in the control cost calculations. Facilities equipped with dry scrubbers followed by fabric filters typically mix their flyash and bottom ash prior to disposal. After mixing the flyash and bottom ash facilities perform an toxicity characteristics leachate procedure (TCLP) test. If the mixture of flyash and bottom ash passes the test, the waste is then disposed of in a municipal landfill. In most cases, the mixture of flyash and bottom ash passes the TCLP test. However, if facilities are not allowed to mix the flyash and bottom ash, the bottom ash typically passes the TCLP test while the flyash typically does not. Most States allow the mixing of flyash and bottom ash prior to TCLP testing. Nevertheless, some States do not allow mixing of flyash and bottom ash. In order to account for this, the higher cost to dispose of flyash as hazardous waste replaced the cost to dispose of flyash as municipal waste in the control cost calculations for the revised cost estimates. The hazardous waste disposal cost for flyash was assumed to be \$320 per ton based on information from a hazardous waste disposal contractor. Table 2 presents the annual flyash disposal costs that were added to the control costs for new model MWI's with combined dry/wet control systems.

When determining the revised cost impacts of the NSPS, the increase in the annual and capital costs associated with the NSPS was evaluated for each new MWI under each regulatory option. The cost increase associated with the NSPS includes that annual and capital costs of control (including flyash disposal), testing and monitoring, and operator training. Because the costs associated with the NSPS have been revised, the switching analysis has been updated based on the new costs.

For each new onsite MWI under switching scenarios B and C, the annual control (including flyash disposal), monitoring, and operator training costs associated with complying with the standards were compared to the annual commercial disposal costs. In cases where the annual control, monitoring, and operator training costs exceeded the annual commercial disposal costs, it was assumed that the potential owner of the new MWI would switch to commercial disposal (or commercial disposal and landfilling under scenario B). For facilities that switch under scenarios B and C, the cost impacts of the NSPS were assumed to be the annual costs associated with commercial disposal (or commercial disposal and landfilling under scenario B). Commercial MWI's were not subjected to the switching analyses under scenarios B and C because switching to an alternative method of waste disposal (i.e., commercial disposal) may not be a feasible option for facilities building new commercial MWI's. It was assumed that new commercial facilities would be constructed with the controls necessary to meet the NSPS.

There was no change in the results of the revised switching analysis for new MWI's. Under scenario B, all potential owners of new small, medium, and large MWI's are expected to switch to commercial disposal and landfilling. Under scenario C, potential owners of new small and medium MWI's are expected to switch to commercial disposal. Because there was no change in the results of the switching analyses, the air, solid waste, wastewater, and energy impacts of the NSPS are the same as the previous estimates. These estimates, which were documented in two separate memoranda, have been included in section IV of this document.^{7,8}

IV. Results of the Impact Analyses

A. Existing MWI's

- 1. Cost Impacts. The results of the cost calculations for existing MWI's are presented in Tables 3 and 4 below. The tables below present costs for small (≤200 lb/hr), medium (>200-500 lb/hr), and large (>500 lb/hr) units. The total annual and capital costs are presented in Table 5. The total annual and total capital costs include the small, medium, large, and commercial cost for each option and corresponding scenario. Table 6 presents the number of small, medium, and large existing MWI that switch under each of the regulatory options for scenarios B and C.
- 2. Air Impacts. Table 7 presents the baseline emissions for existing MWI's. The results of the air impacts for the six regulatory options and the three switching scenarios are contained in Tables 8 through 25. Each of the tables present the amount of pollutants emitted by small and medium batch and nonbatch units, as well as large onsite and commercial units. In cases where onsite facilities were assumed to switch to commercial disposal, the emissions produced from burning the facility's waste offsite are included in the commercial MWI emissions. The pollutants in the tables are measured in tons per year (tons/yr) with the exception of CDD/CDF and TEQ which are measured in grams per year (g/yr). The final row in each table presents the total air impacts for the corresponding regulatory option. A summary of the total air impacts for each regulatory option under each switching scenario is presented in Tables 26 through 28.
- 3. <u>Solid Waste Impacts</u>. Approximately 845,500 tons of medical waste are currently burned in existing MWI's annually, leaving around 84,600 tons of bottom ash to be disposed in landfills each year. When estimating the solid waste impacts for the EG, the impacts under regulatory option 6, scenario B were examined. Regulatory option 6, scenario B is associated with the most switching and the most separation of waste for disposal in municipal landfills, and therefore, produces the worst case solid waste impacts of the EG. Under regulatory option 6, scenario B 90 percent of the small MWI's, nearly 100 percent of the medium MWI's, and 57 percent of the large onsite MWI's switch to commercial disposal and landfilling. Table 29 shows the worst case increase in the annual baseline amount of solid waste from MWI facilities that could be disposed of in a landfill as a result of the EG.
- 4. <u>Wastewater Impacts</u>. Regulatory option 6, scenario A was used to estimate the worst case wastewater impacts of the EG. Under regulatory option 6, scenario A, it was assumed that no existing MWI's shut down and that all MWI's would be retrofitted with a high efficiency wet scrubber. Table 30 presents the annual volume of wet scrubber blowdown and the annual amount

of pollutants that could be discharged in the wastewater from the wet scrubber systems as a result of the EG. The wastewater impacts presented in Table 30 represent the worst case wastewater impacts of the EG.

5. Energy Impacts. The worst case energy impacts for existing MWI's would occur if all MWI's operate under the control of a high efficiency wet scrubber to meet the requirements of the EG. Thus, the worst case energy impacts of the EG were calculated using regulatory option 6, scenario A. The energy impacts of regulatory option 6, scenario A consist of the additional auxiliary fuel usage for good combustion controls and the additional electricity usage for the wet scrubber systems. Tables 31 and 32 present the increase in the annual auxiliary fuel and electricity usage for existing MWI's that would be retrofitted with high efficiency wet scrubber systems under the EG. The values presented in Tables 31 and 32 represent the worst case energy impacts that could result from the EG.

B. New MWI's

1. Cost Impacts. Table 33 presents the annual and capital costs associated with each of the regulatory options and scenarios under consideration for the NSPS for new onsite MWI's. The costs presented in Table 33 are the total annual and capital costs incurred by the fifth year after promulgation of the NSPS. Facilities that have a zero capital cost in Table 33 are the facilities that were assumed to switch to commercial disposal. The annual costs presented in Table 33 for the facilities that switch are the total annual commercial disposal costs for the fifth year after promulgation of the NSPS. The annual and capital costs associated with new commercial MWI's incurred by the fifth year after promulgation of the NSPS are presented in Table 34.

Table 35 presents the total cost associated with each of regulatory options and scenarios for the 5-year time period after promulgation of the final rule. The lowest total annual and capital costs incurred by new MWI facilities in the five years after promulgation are \$12,131,630 and \$7,584,940, respectively, and occur under all regulatory options of scenario B. The highest total annual and capital costs for the five years after promulgation of the rule for new units are \$37,576,570 and \$128,590,850, respectively. These highest costs occur under regulatory option 3 and scenario A. Table 36 presents the number of small, medium, and large MWI that switch under each of the regulatory options for scenarios B and C.

2. <u>Air Impacts</u>. Table 37 presents the baseline air emissions for new MWI's. Tables 38 though 46 present the air emission impacts that are expected to result from the implementation of the NSPS in the fifth year after adoption. Tables 38 through 40 present the air impacts of regulatory option 1 under each switching scenario. Tables 41 through 43 present the air impacts of regulatory option 2 under each switching scenario B and tables 44 through 46 present the air impacts of regulatory option 3 under each switching scenario. A summary of the total air impacts for each of the regulatory options under each switching scenario is presented in Tables 47 through 49.

The emissions produced from burning waste from onsite facilities that were assumed to switch to commercial disposal (in which case the waste was assumed to be burned in an existing

commercial MWI) are not included with the commercial MWI emissions in Tables 37 through 46. This is because new commercial MWI's are different from existing commercial MWI's in that new commercial MWI's must meet the requirements of the NSPS and existing MWI's must meet the requirements of the EG. In cases where facilities were assumed to switch, the emissions produced from burning the facilities' waste offsite are included in the table next to the corresponding MWI size. An asterisk is used in the tables to indicate which size categories switch.

3. Solid Waste Impacts. Regulatory option 3, scenario B was used to determine the worst case solid waste impacts of the NSPS for new MWI's. Under this regulatory option, it is expected that all facilities that would have purchased an onsite MWI in the absence of the NSPS may, instead, choose to use a commercial disposal service and separate their waste streams into infectious and noninfectious portions. The infectious portions would be removed from the generation site by a commercial medical waste hauler and the noninfectious portion would be landfilled as municipal solid waste. The additional amount of solid waste generated due to the NSPS for new units under this regulatory scenario would be: (1) the amount of waste that is landfilled in addition to the amount of ash that would have been landfilled if the noninfectious portion of the waste was incinerated, and (2) the amount of solid waste generated by dry injection/fabric filter systems with carbon on new commercial MWI. The solid waste associated with dry injection/fabric filter systems with carbon consists of the material that accumulates on the fabric filters. The fabric filters trap PM and the pollutants removed by the system, as well as any unreacted lime, reaction products (CaCl₂), and injected carbon.

Table 50 presents the worst case solid waste impacts of the NSPS for new MWI's. It was estimated that the annual solid waste generation rate associated with new MWI's could increase by approximately 48,000 tons per year by the fifth year after implementation of the NSPS. Around 95 percent of this increase would be due to potential MWI owners electing to landfill the noninfectious portion of their waste and have the infectious portion removed by a commercial hauler.

- 4. <u>Wastewater Impacts</u>. Regulatory option 3, scenario A was used to estimate the worst case wastewater impacts of the NSPS. Under regulatory option 3, scenario A, it was assumed that potential owners of new MWI's would install the controls required to meet the emission limits in the NSPS. Table 51 presents the annual volume of wet scrubber blowdown and the annual amount of pollutants that could be discharged in the wastewater from the wet scrubber systems as a result of the NSPS. The wastewater impacts presented in Table 51 represent the worst case wastewater impacts that could be incurred by the fifth year following implementation of the NSPS.
- 5. Energy Impacts. For new MWI's, the regulatory option for the NSPS that would cause the greatest energy impacts would be based on: (1) small MWI's with high efficiency wet scrubber control, and (2) medium and large MWI's with the control of a high efficiency wet scrubber combined with a dry injection/fabric filter system with carbon. Thus, to estimate the worst case energy impacts, it was assumed that potential owners of new MWI's would install MWI's with the controls required by the NSPS, and that no potential new MWI owners would choose an alternative method of waste disposal (i.e, regulatory option 3, scenario A was used).

Because all new MWI's were assumed to have at least good combustion for the baseline level of control, no additional auxiliary fuel usage was associated with the NSPS requirements for new units. Table 52 presents the additional electricity usage that could result if new small MWI's operate with a high efficiency wet scrubber and medium or large MWI's operate with a wet/dry control system with carbon. The amounts presented in Table 52 represent the worst case energy impacts of any of the regulatory options under consideration for the NSPS, and are energy impacts that could occur in the fifth year after implementation of the NSPS.

TABLE 1: MONITORING COST ASSOCIATED WITH AIR POLLUTION CONTROLS²

Air pollution control	Annual monitoring cost	Capital monitoring cost
Good combustion	\$10,353	\$15,282
Wet scrubber	\$15,331	\$19,386
Dry scrubber	\$16,621	\$15,390
Dry/wet scrubber	\$17,399	\$19,494

TABLE 2: ANNUAL COSTS FOR FLYASH DISPOSAL AS HAZARDOUS WASTE FOR NEW MWI WITH COMBINED DRY/WET CONTROL SYSTEMS

Model MWI	Annual flyash generated, ton/yr	Flyash disposal cost, \$/yr
Small	Not applicable	Not applicable
Medium	19.7	\$5,564
Large onsite	81.0	\$22,887
Large commercial	263.4	\$74,591

TABLE 3: SUMMARY OF ANNUAL AND CAPITAL COSTS ASSOCIATED WITH THE REGULATORY OPTIONS FOR THE EG

MWI Size	Option-	Annual Cost	Capital Cost
	Scenario		-
Small remote	1-A	\$1,820,342	\$4,326,383
Small non-reomte	1-A	\$16,182,911	\$36,419,752
Medium	1-A	\$11,114,215	\$21,782,965
Large	1-A	\$51,093,560	\$146,731,262
Small remote	1-B	\$1,820,342	\$4,326,383
Small non-remote	1-B	\$5,874,800	\$764,100
Medium	1-B	\$9,669,230	\$8,246,939
Large	1-B	\$32,892,215	\$37,269,816
Small remote	1-C	\$1,820,342	\$4,326,383
Small non-remote	1-C	\$13,207,300	\$17,456,582
Medium	1-C	\$11,114,215	\$21,782,965
Large	1-C	\$51,093,560	\$146,731,262
Small remote	2-A	\$1,820,342	\$4,326,383
Small non-remote	2-A	\$62,975,641	\$202,444,018
Medium	2-A	\$50,998,077	\$150,037,120
Large	2-A	\$51,093,560	\$146,731,262
Small remote	2-B	\$1,820,342	\$4,326,383
Small non-remote	2-B	\$5,931,599	\$0
Medium	2-B	\$13,562,699	\$732,672
Large	2-B	\$32,892,215	\$37,269,816
Small remote	2-C	\$1,820,342	\$4,326,383
Small non-remote	2-C	\$20,637,931	\$1,453,950
Medium	2-C	\$41,226,606	\$37,062,162
Large	2-C	\$51,093,560	\$146,731,262

11 TABLE 3. (continued)

MWI Size	Option- Scenario	Annual Cost	Capital Cost
Small remote	3-A	\$6,866,454	\$22,747,360
Small non-remote	3-A	\$62,975,642	\$202,444,017
Medium	3-A	\$50,998,077	\$150,037,120
Large	3-A	\$51,093,560	\$146,731,262
Small remote	3-B	\$6,866,454	\$22,747,360
Small non-remote	3-B	\$5,931,599	\$0
Medium	3-B	\$13,562,699	\$732,672
Large	3-B	\$32,892,215	\$37,269,816
Small remote	3-C	\$6,866,454	\$22,747,360
Small non-remote	3-C	\$20,637,932	\$1,453,950
Medium	3-C	\$41,226,606	\$37,062,162
Large	3-C	\$51,093,560	\$146,731,262
Small remote	4-A	\$7,626,229	\$25,790,097
Small non- remote	4-A	\$70,286,461	\$231,893,687
Medium	4-A	\$50,998,077	\$150,037,120
Large	4-A	\$51,093,560	\$146,731,262
Small remote	4-B	\$7,626,229	\$25,790,097
Small non-remote	4-B	\$5,931,599	\$0
Medium	4-B	\$13,562,699	\$732,672
Large	4-B	\$32,892,215	\$37,269,816
Small remote	4-C	\$7,626,229	\$25,790,097
Small non-remote	4-C	\$21,499,193	\$4,561,799
Medium	4-C	\$41,226,606	\$37,062,162
Large	4-C	\$51,093,560	\$146,731,262

MWI Size	Option- Scenario	Annual Cost	Capital Cost
Small remote	5-A	\$7,626,229	\$25,790,097
Small non-remote	5-A	\$70,286,461	\$231,893,687
Medium	5-A	\$59,989,004	\$189,138,331
Large	5-A	\$51,093,560	\$146,731,262
Small remote	5-B	\$7,626,229	\$25,790,097
Small non-remote	5-B	\$5,931,599	\$0
Medium	5-B	\$13,792,267	\$34,776
Large	5-B	\$32,892,215	\$37,269,816
Small remote	5-C	\$7,626,229	\$25,790,097
Small non-remote	5-C	\$21,499,193	\$4,561,799
Medium	5-C	\$44,099,339	\$39,689,748
Large	5-C	\$51,093,560	\$146,731,262
Small remote	6-A	\$8,739,868	\$31,349,184
Small non-remote	6-A	\$80,418,543	\$282,311,399
Medium	6-A	\$59,989,004	\$189,138,331
Large	6-A	\$51,093,560	\$146,731,262
Small remote	6-B	\$8,739,868	\$31,349,184
Small non-remote	6-B	\$5,931,599	\$0
Medium	6-B	\$13,792,267	\$34,776
Large	6-B	\$32,892,215	\$37,269,816
Small remote	6-C	\$8,739,868	\$31,349,184
Small non-remote	6-C	\$21,832,972	\$3,035,720
Medium	6-C	\$44,099,339	\$39,689,748
Large	6-C	\$51,093,560	\$146,731,262

TABLE 4: ANNUAL AND CAPITAL COSTS FOR EXISTING COMMERCIAL MWI'S

Regulatory Option	Annual cost	Capital cost
1 to 4	4,948,460	13,209,321
5 and 6	4,971,523	13,314,841

TABLE 5: TOTAL ANNUAL AND CAPITAL COST FOR EACH REGULATORY OPTION FOR THE EG

Option-scenario	Total annual cost	Total capital cost
1-A	85,159,488	222,469,683
1-B	55,205,047	63,816,559
1-C	82,183,877	203,562,316
2-A	171,836,080	516,748,104
2-B	59,155,315	55,538,192
2-C	119,726,899	202,783,078
3-A	176,882,193	535,169,080
3-B	64,201,427	73,959,169
3-C	124,773,012	221,204,055
4-A	184,952,787	567,661,487
4-B	64,961,201	77,001,906
4-C	126,394,048	227,354,641
5-A	193,966,777	606,868,218
5-B	65,213,832	76,409,530
5-C	129,289,844	230,087,747
6-A	205,212,498	662,845,017
6-B	66,327,471	81,968,617
6-C	130,737,262	234,120,755

TABLE 6: NUMBER OF EXISTING MWI'S THAT DO NOT SWITCH

				Regulato	ry Option						
MWI type	Total	1	2	3	4	5	6				
Scenario B											
Small rural remote non-rural remote	1,139 114 1,025	164 114 50	114 114 0	114 114 0	114 114 0	114 114 0	114 114 0				
Medium	692	483	38	38	38	2	2				
Large	463	198	198	198	198	198	198				
Commercial	79	79	79	79	79	79	79				
Total	2,373	924	429	429	429	393	393				
			Scenario	С							
Small rural remote non-rural remote	1,139 114 1,025	708 114 594	189 114 75	189 114 75	170 114 56	170 114 56	135 114 21				
Medium	692	692	279	279	279	232	232				
Large	463	463	463	463	463	463	463				
Commercial	79	79	79	79	79	79	79				
Total	2,373	1,942	1,010	1,010	991	944	909				

TABLE 7. BASELINE AIR EMISSIONS FROM EXISTING MWI'S

	ton	s/yr	g/	yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg
Small Batch Nonbatch	9.51 116	42.3 72.3	909 1,300	18.5 26.5	122 753	1.75 12.5	8.24 58.8	0.206 1.30	0.022 0.140	0.201 1.25
Medium Batch Nonbatch	2.92 206	12.5 85.4	264 1,150	5.40 23.6	40.9 1,500	0.585 31.0	2.76 146	0.069 2.64	0.007 0.288	0.068 2.53
Large Onsite Commercial	527 175	234 59.9	3,010 587	61.6 12.3	3,510 374	98.7 126	466 595	6.39 1.31	0.704 0.167	6.13 5.86
Total	1,040	506	7,220	148	6,300	271	1,280	11.9	1.33	16.0

TABLE 8. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 1-A

	ton	s/yr	g/	yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO_x	Pb	Cd	Hg
Small Batch Nonbatch	3.27 81.4	0.829 5.92	18.0 113	0.367 2.32	122 753	1.75 12.5	8.24 58.8	0.206 1.30	0.022 0.140	0.060 0.377
Medium Batch Nonbatch	1.10 175	0.278 14.7	6.05 239	0.123 4.90	40.9 1,500	0.585 31.0	2.76 146	0.069 2.64	0.007 0.288	0.020 0.787
Large Onsite Commercial	47.4 42.9	46.9 59.9	138 105	3.19 2.49	16.4 72.8	98.7 126	466 595	0.978 0.841	0.136 0.118	0.409 0.567
Total	351	129	618	13.4	2,510	271	1,280	6.03	0.711	2.22

TABLE 9. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 1-B

	tons	s/yr	g/	g/yr		tons/yr				
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg
Small Batch Nonbatch	0.161 14.8	0.041 1.02	0.886 21.2	0.018 0.433	5.99 143	0.086 2.14	0.404 10.1	0.010 0.243	0.001 0.026	0.003 0.070
Medium Batch Nonbatch	0.104 128	0.026 11.0	0.572 173	0.012 3.57	3.87 1,080	0.055 23.2	0.261 110	0.007 1.91	0.001 0.209	0.002 0.562
Large Onsite Commercial	21.2 48.4	22.0 65.1	74.3 118	1.69 2.80	10.6 74.0	46.3 137	219 646	0.435 0.954	0.060 0.133	0.194 0.612
Total	213	99.2	389	8.52	1,320	209	985	3.56	0.431	1.44

TABLE 10. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 1-C

	ton	s/yr	g/	/yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO_x	Pb	Cd	Hg
Small Batch Nonbatch	1.32 69.7	0.332 5.11	7.24 96.8	0.148 1.98	49.0 642	0.700 10.7	3.30 50.7	0.083 1.11	0.009 0.120	0.024 0.322
Medium Batch Nonbatch	1.10 175	0.278 14.7	6.05 239	0.123 4.90	40.9 1,500	0.585 31.0	2.76 146	0.069 2.64	0.007 0.288	0.020 0.787
Large Onsite Commercial	47.4 44.3	46.9 61.2	138 108	3.19 2.57	16.4 73.1	98.7 129	466 608	0.978 0.869	0.136 0.122	0.409 0.579
Total	339	129	595	12.9	2,320	271	1,280	5.75	0.681	2.14

TABLE 11. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 2-A

	tons	s/yr	g/	z/yr tons/yr						
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg
Small Batch Nonbatch	1.37 37.1	0.829 5.92	2.89 22.0	0.066 0.495	6.17 54.1	1.75 12.5	8.24 58.8	0.027 0.211	0.003 0.027	0.010 0.074
Medium Batch Nonbatch	0.167 30.8	0.278 14.7	0.706 41.7	0.017 0.974	0.065 3.56	0.585 31.0	2.76 146	0.006 0.320	0.001 0.044	0.002 0.127
Large Onsite Commercial	47.4 42.9	46.9 59.9	138 105	3.19 2.49	16.4 72.8	98.7 126	466 595	0.978 0.841	0.136 0.118	0.409 0.567
Total	160	129	310	7.23	153	271	1,280	2.38	0.328	1.19

TABLE 12. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 2-B

	tons	s/yr	g/	yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg
Small Batch Nonbatch	0.161 5.66	0.041 0.408	0.886 7.92	0.018 0.162	5.99 52.8	0.086 0.858	0.404 4.05	0.010 0.091	0.001 0.010	0.003 0.026
Medium Batch* Nonbatch	0 1.82	0 0.894	0 6.64	0 0.143	0 0.208	0 1.88	0 8.89	0 0.019	0 0.003	0 0.008
Large Onsite Commercial	21.2 50.1	22.0 66.7	74.3 122	1.69 2.90	10.6 74.4	46.3 140	219 662	0.435 0.989	0.060 0.138	0.194 0.626
Total	78.9	90.0	212	4.91	144	189	894	1.54	0.212	0.857

^{*} All MWI's in this size category switch.

TABLE 13. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 2-C

	tons	s/yr	g/	yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO_x	Pb	Cd	Hg
Small Batch Nonbatch	0.161 9.49	0.041 1.11	0.886 9.71	0.018 0.204	5.99 53.0	0.086 2.33	0.404 11.0	0.010 0.106	0.001 0.012	0.003 0.032
Medium Batch* Nonbatch	0 13.9	0 6.68	0 21.2	0 0.489	0 1.69	0 14.1	0 66.3	0 0.144	0 0.020	0 0.058
Large Onsite Commercial	47.4 57.6	46.9 73.8	138 140	3.19 3.33	16.4 76.0	98.7 155	466 733	0.978 1.15	0.136 0.160	0.409 0.687
Total	129	129	310	7.23	153	271	1,280	2.38	0.328	1.19

^{*} All MWI's in this size category switch.

TABLE 14. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 3-A

	tons	s/yr	g/	yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg
Small Batch Nonbatch	1.27 33.7	0.829 5.92	2.11 15.1	0.050 0.357	0.193 1.38	1.75 12.5	8.24 58.8	0.018 0.129	0.003 0.018	0.007 0.051
Medium Batch Nonbatch	0.167 30.8	0.278 14.7	0.706 41.7	0.017 0.974	0.065 3.56	0.585 31.0	2.76 146	0.006 0.320	0.001 0.044	0.002 0.127
Large Onsite Commercial	47.4 42.9	46.9 59.9	138 105	3.19 2.49	16.4 72.8	98.7 126	466 595	0.978 0.841	0.136 0.118	0.409 0.567
Total	156	129	302	7.07	94.4	271	1,280	2.29	0.319	1.16

TABLE 15. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 3-B

	tons	s/yr	g/	yr	tons/yr						
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO_x	Pb	Cd	Hg	
Small Batch Nonbatch	0.062 2.31	0.041 0.408	0.103 1.04	0.002 0.025	0.009 0.095	0.086 0.858	0.404 4.05	0.001 0.009	<0.000 0.001	<0.000 0.004	
Medium Batch* Nonbatch	0 1.82	0 0.894	0 6.64	0 0.143	0 0.208	0 1.88	0 8.89	0 0.019	0 0.003	0 0.008	
Large Onsite Commercial	21.2 50.1	22.0 66.7	74.3 122	1.69 2.90	10.6 74.4	46.3 140	219 662	0.435 0.989	0.060 0.138	0.194 0.626	
Total	75.5	90.0	204	4.75	85.3	189	894	1.45	0.203	0.832	

^{*} All MWI's in this size category switch.

TABLE 16. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 3-C

	tons	s/yr	g/	′yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg
Small Batch Nonbatch	0.062 6.14	0.041 1.11	0.103 2.81	0.002 0.067	0.009 0.258	0.086 2.33	0.404 11.0	0.001 0.024	<0.000 0.003	<0.000 0.010
Medium Batch [*] Nonbatch	0 13.9	0 6.68	0 21.2	0 0.489	0 1.69	0 14.1	0 66.3	0 0.144	0 0.020	0 0.058
Large Onsite Commercial	47.4 57.6	46.9 73.8	138 140	3.19 3.33	16.4 76.0	98.7 155	466 733	0.978 1.15	0.136 0.160	0.409 0.687
Total	125	129	302	7.07	94.4	271	1,280	2.29	0.319	1.16

 $[\]ensuremath{^{*}}$ All MWI's in this size category switch.

TABLE 17. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 4-A

	tons	s/yr	g/	yr	r tons/yr						
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg	
Small Batch Nonbatch	0.499 12.5	0.829 5.92	2.11 15.1	0.050 0.357	0.193 1.38	1.75 12.5	8.24 58.8	0.018 0.129	0.003 0.018	0.007 0.051	
Medium Batch Nonbatch	0.167 30.8	0.278 14.7	0.706 41.7	0.017 0.974	0.065 3.56	0.585 31.0	2.76 146	0.006 0.320	0.001 0.044	0.002 0.127	
Large Onsite Commercial	47.4 42.9	46.9 59.9	138 105	3.19 2.49	16.4 72.8	98.7 126	466 595	0.978 0.841	0.136 0.118	0.409 0.567	
Total	134	129	302	7.07	94.4	271	1,280	2.29	0.319	1.16	

TABLE 18. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 4-B

	tons	s/yr	g/	yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg
Small Batch Nonbatch	0.024 0.858	0.041 0.408	0.103 1.04	0.002 0.025	0.009 0.095	0.086 0.858	0.404 4.05	0.001 0.009	<0.000 0.001	<0.000 0.004
Medium Batch* Nonbatch	0 1.82	0 0.894	0 6.64	0 0.143	0 0.208	0 1.88	0 8.89	0 0.019	0 0.003	0 0.008
Large Onsite Commercial	21.2 50.1	22.0 66.7	74.3 122	1.69 2.90	10.6 74.4	46.3 140	219 662	0.435 0.989	0.060 0.138	0.194 0.626
Total	74.0	90.0	204	4.75	85.3	189	894	1.45	0.203	0.832

 $[\]ensuremath{^{*}}$ All MWI's in this size category switch.

TABLE 19. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 4-C

	tons	s/yr	g/	yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO_x	Pb	Cd	Hg
Small Batch Nonbatch	0.024 2.07	0.041 0.981	0.103 2.49	0.002 0.059	0.009 0.228	0.086 2.07	0.404 9.74	0.001 0.021	<0.000 0.003	<0.000 0.008
Medium Batch* Nonbatch	0 13.9	0 6.68	0 21.2	0 0.489	0 1.69	0 14.1	0 66.3	0 0.144	0 0.020	0 0.058
Large Onsite Commercial	47.4 57.7	46.9 73.9	138 141	3.19 3.34	16.4 76.1	98.7 156	466 734	0.978 1.15	0.136 0.160	0.409 0.688
Total	121	129	302	7.07	94.4	271	1,280	2.29	0.319	1.16

^{*} All MWI's in this size category switch.

TABLE 20. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 5-A

	tons	s/yr	g/	yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg
Small Batch Nonbatch	0.499 12.5	0.829 5.92	2.11 15.1	0.050 0.357	0.193 1.38	1.75 12.5	8.24 58.8	0.018 0.129	0.003 0.018	0.007 0.051
Medium Batch Nonbatch	0.075 15.4	0.278 14.7	0.706 41.7	0.017 0.974	0.065 3.56	0.585 31.0	2.76 146	0.006 0.320	0.001 0.044	0.002 0.127
Large Onsite Commercial	47.4 42.9	46.9 59.9	138 105	3.19 2.49	16.4 72.8	98.7 126	466 595	0.978 0.841	0.136 0.118	0.409 0.567
Total	119	129	302	7.07	94.4	271	1,280	2.29	0.319	1.16

TABLE 21. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 5-B

	tons	s/yr	g/	/yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg
Small Batch Nonbatch	0.024 0.858	0.041 0.408	0.103 1.04	0.002 0.025	0.009 0.095	0.086 0.858	0.404 4.05	0.001 0.009	<0.000 0.001	<0.000 0.004
Medium Batch* Nonbatch	0 0.023	0 0.041	0 4.47	0 0.091	0 0.009	0 0.085	0 0.403	0 <0.000	0 <0.000	0 <0.000
Large Onsite Commercial	21.2 50.2	22.0 66.8	74.3 123	1.69 2.91	10.6 74.4	46.3 141	219 664	0.435 0.992	0.060 0.139	0.194 0.627
Total	72.3	89.3	202	4.71	85.1	188	887	1.44	0.200	0.826

^{*} All MWI's in this size category switch.

TABLE 22. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 5-C

	tons	s/yr	g/	′yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg
Small Batch Nonbatch	0.024 2.07	0.041 0.981	0.103 2.49	0.002 0.059	0.009 0.228	0.086 2.07	0.404 9.74	0.001 0.021	<0.000 0.003	<0.000 0.008
Medium Batch* Nonbatch	0 5.52	0 5.30	0 17.7	0 0.406	0 1.37	0 11.2	0 52.7	0 0.114	0 0.016	0 0.046
Large Onsite Commercial	47.4 59.2	46.9 75.3	138 144	3.19 3.42	16.4 76.4	98.7 159	466 748	0.978 1.18	0.136 0.164	0.409 0.700
Total	114	129	302	7.07	94.4	271	1,280	2.29	0.319	1.16

 $[\]ensuremath{^{*}}$ All MWI's in this size category switch.

TABLE 23. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 6-A

	tons	s/yr	g/	yr	tons/yr					
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg
Small Batch Nonbatch	0.25 6.24	0.829 5.92	2.11 15.1	0.050 0.357	0.193 1.38	1.75 12.5	8.24 58.8	0.018 0.129	0.003 0.018	0.007 0.051
Medium Batch Nonbatch	0.075 15.4	0.278 14.7	0.706 41.7	0.017 0.974	0.065 3.56	0.585 31.0	2.76 146	0.006 0.320	0.001 0.044	0.002 0.127
Large Onsite Commercial	47.4 42.9	46.9 59.9	138 105	3.19 2.49	16.4 72.8	98.7 126	466 595	0.978 0.841	0.136 0.118	0.409 0.567
Total	112	129	302	7.07	94.4	271	1,280	2.29	0.319	1.16

TABLE 24. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 6-B

	tons	s/yr	g/	yr	tons/yr					
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg
Small										
Batch	0.011	0.041	0.103	0.002	0.009	0.086	0.404	0.001	< 0.000	< 0.000
Nonbatch	0.429	0.408	1.04	0.025	0.095	0.858	4.05	0.009	0.001	0.004
Medium										
Batch*	0	0	0	0	0	0	0	0	0	0
Nonbatch	0.023	0.041	4.47	0.091	0.009	0.085	0.403	< 0.000	< 0.000	< 0.000
Large										
Onsite	21.2	22.0	74.3	1.69	10.6	46.3	219	0.435	0.060	0.194
Commercial	50.2	66.8	123	2.91	74.4	140	664	0.992	0.139	0.627
Total	71.9	89.3	202	4.71	85.1	188	887	1.44	0.200	0.826

 $[\]ensuremath{^{*}}$ All MWI's in this size category switch.

TABLE 25. AIR EMISSIONS FROM EXISTING MWI'S UNDER REGULATORY OPTION-SCENARIO 6-C

	ton	s/yr	g/	⁄yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg
Small Batch Nonbatch	0.011 0.689	0.041 0.655	0.103 1.66	0.002 0.039	0.009 0.152	0.086 1.38	0.404 6.51	0.001 0.014	<0.000 0.002	<0.000 0.006
Medium Batch [*] Nonbatch	0 5.52	0 5.30	0 17.7	0 0.406	0 1.37	0 11.2	0 52.7	0 0.114	0 0.016	0 0.046
Large Onsite Commercial	47.4 59.5	46.9 75.6	138 145	3.19 3.44	16.4 76.5	98.7 159	466 751	0.978 1.19	0.136 0.165	0.409 0.703
Total	113	129	302	7.07	94.4	271	1,280	2.29	0.319	1.16

^{*} All MWI's in this size category switch.

TABLE 26. SUMMARY OF TOTAL AIR EMISSONS FROM EXISTING MWI'S UNDER EACH REGULATORY OPTION FOR THE EG (SCENARIO A)

		Regulatory Option					
Pollutant/Units	Baseline	1	2	3	4	5	6
PM, ton/yr	1,040	351	160	156	134	119	112
CO, ton/yr	506	129	129	129	129	129	129
CDD/CDF, g/yr	7,220	618	310	302	302	302	302
TEQ CDD/CDF, g/yr	148	13.4	7.23	7.07	7.07	7.07	7.07
HCl, ton/yr	6,300	2,510	153	94.4	94.4	94.4	94.4
SO ₂ , ton/yr	271	271	271	271	271	271	271
NO _x , ton/yr	1,280	1,280	1,280	1,280	1,280	1,280	1,280
Pb, ton/yr	11.9	6.03	2.38	2.29	2.29	2.29	2.29
Cd, ton/yr	1.33	0.711	0.328	0.319	0.319	0.319	0.319
Hg, ton/yr	16.0	2.22	1.19	1.16	1.16	1.16	1.16

TABLE 27. SUMMARY OF TOTAL AIR EMISSONS FROM EXISTING MWI'S UNDER EACH REGULATORY OPTION FOR THE EG (SCENARIO B)

		Regulatory Option					
Pollutant/Units	Baseline	1	2	3	4	5	6
PM, ton/yr	1,040	213	78.9	75.5	74.0	72.3	71.9
CO, ton/yr	506	99.2	90.0	90.0	90.0	89.3	89.3
CDD/CDF, g/yr	7,220	389	212	204	204	202	202
TEQ CDD/CDF, g/yr	148	8.52	4.91	4.75	4.75	4.71	4.71
HCl, ton/yr	6,300	1,320	144	85.3	85.3	85.1	85.1
SO ₂ , ton/yr	271	209	189	189	189	188	188
NO _x , ton/yr	1,280	985	894	894	894	887	887
Pb, ton/yr	11.9	3.56	1.54	1.45	1.45	1.44	1.44
Cd, ton/yr	1.33	0.431	0.212	0.203	0.203	0.200	0.200
Hg, ton/yr	16.0	1.44	0.857	0.832	0.832	0.826	0.826

TABLE 28. SUMMARY OF TOTAL AIR EMISSONS FROM EXISTING MWI'S UNDER EACH REGULATORY OPTION FOR THE EG (SCENARIO C)

		Regulatory Option					
Pollutant/Units	Baseline	1	2	3	4	5	6
PM, ton/yr	1,040	339	129	125	121	114	113
CO, ton/yr	506	129	129	129	129	129	129
CDD/CDF, g/yr	7,220	595	310	302	302	302	302
TEQ CDD/CDF, g/yr	148	12.9	7.23	7.07	7.07	7.07	7.07
HCl, ton/yr	6,300	2,320	153	94.4	94.4	94.4	94.4
SO ₂ , ton/yr	271	271	271	271	271	271	271
NO _x , ton/yr	1,280	1,280	1,280	1,280	1,280	1,280	1,280
Pb, ton/yr	11.9	5.75	2.38	2.29	2.29	2.29	2.29
Cd, ton/yr	1.33	0.681	0.328	0.319	0.319	0.319	0.319
Hg, ton/yr	16.0	2.14	1.19	1.16	1.16	1.16	1.16

TABLE 29. POTENTIAL INCREASE IN ANNUAL SOLID WASTE LANDFILLED AS A RESULT OF THE EG FOR EXISTING MWI'S

MWI type	Percent switching	Landfilled waste, ton/yr
Small		
Batch	92	3,970
Nonbatch	89	27,800
Medium		
Batch	100	1,400
Nonbatch	100	73,900
Large		
Onsite	57	125,000
Commercial	NA	821
Total		233,000

^{*}NA - Not Applicable. It was assumed that commercial units do not switch to alternative methods of waste disposal.

TABLE 30. INCREASE IN THE ANNUAL BLOWDOWN VOLUME AND ANNUAL AMOUNT OF POLLUTANTS DISCHARGED IN THE WASTEWATER OF HIGH EFFICIENCY WET SCRUBBER SYSTEMS RETROFITTTED ON EXISTING MWI'S

		Pollutants in wastewater (lb/yr)				
MWI Type	Blowdown, gal/yr	PM	Pb	Cd	Hg	TEQ
Small						
Batch	1,120,000	6,100	376	40	387	0.0008
Nonbatch	27,630,000	150,000	2,330	245	2,400	0.0052
Medium						
Batch	396,000	2,050	13	13	130	0.0003
Nonbatch	58,800,000	319,000	4,640	487	4,780	0.0103
Large						
Onsite	104,000,000	794,000	10,800	1,140	11,100	0.024
Commercial	5,740,000	263,000	936	98	963	0.0024
Total	198,000,000	1,530,000	19,100	2,020	19,760	0.043

TABLE 31. ADDITIONAL ANNUAL AUXILIARY FUEL USAGE AS A RESULT OF THE EG FOR EXISTING MWI'S

MWI type	Fuel usage, mmft ³ /yr
Small Batch Nonbatch	134 76.5
Medium Batch Nonbatch	41.2 123
Large Onsite Commercial	211 0
Total	586

TABLE 32. ADDITIONAL ANNUAL ELECTRICITY USAGE AS A RESULT OF THE EG FOR EXISTING MWI'S

MWI type	Electricity usage, MWh/yr
Small Batch Nonbatch	9,590 32,300
Medium Batch Nonbatch	2,710 64,700
Large Onsite Commercial	128,000 21,200
Total	259,000

TABLE 33. SUMMARY OF ANNUAL AND CAPITAL COSTS ASSOCIATED WITH THE REGULATORY OPTIONS FOR THE NSPS

MWI size	Option-scenario	Annual cost	Capital cost
Small	1-A	5,796,490	18,732,810
Medium	1-A	14,360,670	58,697,460
Large	1-A	12,483,780	39,173,640
Small	1-B	543,000	0
Medium	1-B	2,051,500	0
Large	1-B	5,955,500	0
Small	1-C	2,168,500	0
Medium	1-C	7,990,000	0
Large	1-C	12,483,780	39,173,640
Small	2-A	5,796,490	18,732,810
Medium	2-A	14,864,670	58,985,460
Large	2-A	12,483,780	39,173,640
Small	2-B	543,000	0
Medium	2-B	2,051,500	0
Large	2-B	5,955,500	0
Small	2-C	2,168,500	0
Medium	2-C	7,990,000	0
Large	2-C	12,483,780	39,173,640
Small	3-A	6,646,490	22,846,810
Medium	3-A	14,864,670	58,985,460
Large	3-A	12,483,780	39,173,640
Small	3-B	543,000	0
Medium	3-B	2,051,500	0
Large	3-B	5,955,500	0
Small	3-C	2,168,500	0
Medium	3-C	7,990,000	0
Large	3-C	12,483,780	39,173,640

TABLE 34. ANNUAL AND CAPITAL COSTS FOR NEW COMECIAL MWI'S

Regulatory Option	Annual cost	Capital cost
1 to 3	3,581,630	7,584,940

TABLE 35. TOTAL ANNUAL AND CAPITAL COST OF EACH REGULATORY OPTION FOR THE NSPS

Option-scenario	Total annual cost	Total capital cost
1-A	36,222,570	124,188,850
1-B	12,131,630	7,584,940
1-C	26,223,910	46,758,580
2-A	36,726,570	124,476,850
2-B	12,131,630	7,584,940
2-C	26,223,910	46,758,580
3-A	37,576,570	128,590,850
3-B	12,131,630	7,584,940
3-C	26,223,910	46,758,580

TABLE 36: NUMBER OF NEW MWI'S THAT DO NOT SWITCH

MWI Type	Total	Regulatory Opt	ion	
		1	2	3
	Scer	nario B		
Small	85	0	0	0
Medium	90	0	0	0
Large	60	0	0	0
Commercial	10	10	10	10
Total	245	10	10	10
	Scer	nario C		
Small	85	0	0	0
Medium	90	0	0	0
Large	60	60	60	60
Commercial	10	10	10	10
Total	245	70	70	70

TABLE 37. BASELINE AIR EMISSIONS FROM NEW MWI'S

	tons	s/yr	g/	yr	tons/yr							
MWI category	PM	CO	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg		
Small												
Batch	0.482	0.122	2.65	0.054	17.9	0.256	1.21	0.030	0.003	0.030		
Nonbatch	5.04	0.334	7.28	0.148	49.3	0.704	3.32	0.084	0.009	0.081		
Medium	11.9	2.08	5.28	0.125	0.483	4.37	20.6	0.045	0.006	0.018		
Large												
Onsite	6.83	6.49	16.5	0.391	1.51	13.7	64.5	0.142	0.020	0.056		
Commercial	6.17	5.86	14.9	0.353	1.37	12.3	58.2	0.128	0.018	0.051		
Total	30.4	14.9	46.6	1.07	70.6	31.3	148	0.429	0.056	0.235		

TABLE 38. AIR EMISSIONS FROM NEW MWI'S UNDER REGULATORY OPTION-SCENARIO 1-A

	ton	s/yr	g/	yr			ton	.s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg
Small Batch Nonbatch	0.073 0.704	0.122 0.334	0.309 0.850	0.007 0.020	0.028 0.078	0.256 0.704	1.21 3.32	0.003 0.007	<0.000 0.001	0.001 0.003
Medium	0.313	2.08	5.28	0.125	0.483	4.37	20.6	0.002	< 0.000	0.018
Large Onsite Commercial	0.978 0.883	6.49 5.86	2.73 2.46	0.065 0.059	1.51 1.37	13.7 12.3	64.5 58.2	0.006 0.005	0.001 0.001	0.056 0.051
Total	2.95	14.9	11.6	0.276	3.47	31.3	148	0.022	0.004	0.128

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TABLE 39. AIR EMISSIONS FROM NEW MWI'S UNDER REGULATORY OPTION-SCENARIO 1-B

	tons	s/yr	g/	yr	tons/yr						
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO_x	Pb	Cd	Hg	
Small* Batch Nonbatch	0.019 0.053	0.018 0.050	0.046 0.128	0.001 0.003	0.004 0.012	0.038 0.106	0.181 0.498	<0.000 0.001	<0.000 <0.000	<0.000 <0.000	
Medium*	0.328	0.311	0.791	0.019	0.072	0.655	3.09	0.007	0.001	0.003	
Large Onsite [*] Commercial	1.03 0.883	0.974 5.86	2.48 2.46	0.059 0.059	0.227 1.37	2.05 12.3	9.67 58.2	0.021 0.005	0.003 0.001	0.008 0.051	
Total	2.31	7.21	5.90	0.140	1.68	15.2	71.7	0.035	0.005	0.062	

^{*} All MWI's in this size category switch.

TABLE 40. AIR EMISSIONS FROM NEW MWI'S UNDER REGULATORY OPTION-SCENARIO 1-C

	ton	s/yr	g/	yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO_x	Pb	Cd	Hg
Small* Batch Nonbatch	0.128 0.352	0.122 0.334	0.309 0.850	0.007 0.020	0.028 0.078	0.256 0.704	1.21 3.32	0.003 0.007	<0.000 0.001	0.001 0.003
Medium*	2.18	2.08	5.28	0.125	0.483	4.37	20.6	0.045	0.006	0.018
Large Onsite Commercial	0.978 0.883	6.49 5.86	2.73 2.46	0.065 0.059	1.51 1.37	13.7 12.3	64.5 58.2	0.006 0.005	0.001 0.001	0.056 0.051
Total	4.53	14.9	11.6	0.276	3.47	31.3	148	0.066	0.010	0.128

^{*} All MWI's in this size category switch.

TABLE 41. AIR EMISSIONS FROM NEW MWI'S UNDER REGULATORY OPTION-SCENARIO 2-A

	tons	s/yr	g/	yr	tons/yr						
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg	
Small Batch Nonbatch	0.073 0.704	0.122 0.334	0.309 0.850	0.007 0.020	0.028 0.078	0.256 0.704	1.21 3.32	0.003 0.007	<0.000 0.001	0.001 0.003	
Medium	0.313	2.08	0.872	0.021	0.483	4.37	20.6	0.002	< 0.000	0.018	
Large Onsite Commercial	0.978 0.883	6.49 5.86	2.73 2.46	0.065 0.059	1.51 1.37	13.7 12.3	64.5 58.2	0.006 0.005	0.001 0.001	0.056 0.051	
Total	2.95	14.9	7.22	0.172	3.47	31.3	148	0.022	0.004	0.128	

TABLE 42. AIR EMISSIONS FROM NEW MWI'S UNDER REGULATORY OPTION-SCENARIO 2-B

	ton	s/yr	g/	yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO_x	Pb	Cd	Hg
Small* Batch Nonbatch	0.019 0.053	0.018 0.050	0.046 0.128	0.001 0.003	0.004 0.012	0.038 0.106	0.181 0.498	<0.000 0.001	<0.000 <0.000	<0.000 <0.000
Medium*	0.328	0.311	0.791	0.019	0.072	0.655	3.09	0.007	0.001	0.003
Large Onsite [*] Commercial	1.03 0.883	0.974 5.86	2.48 2.46	0.059 0.059	0.227 1.37	2.05 12.3	9.67 58.2	0.021 0.005	0.003 0.001	0.008 0.051
Total	2.31	7.21	5.90	0.140	1.68	15.2	71.7	0.035	0.005	0.062

^{*} All MWI's in this size category switch.

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TABLE 43. AIR EMISSIONS FROM NEW MWI'S UNDER REGULATORY OPTION-SCENARIO 2-C

	ton	s/yr	g/	yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO_x	Pb	Cd	Hg
Small [*] Batch Nonbatch	0.128 0.352	0.122 0.334	0.309 0.850	0.007 0.020	0.028 0.078	0.256 0.704	1.21 3.32	0.003 0.007	<0.000 0.001	0.001 0.003
Medium*	2.18	2.08	5.28	0.125	0.483	4.37	20.6	0.045	0.006	0.018
Large Onsite Commercial	0.978 0.883	6.49 5.86	2.73 2.46	0.065 0.059	1.51 1.37	13.7 12.3	64.5 58.2	0.006 0.005	0.001 0.001	0.056 0.051
Total	4.53	14.9	11.6	0.276	3.47	31.3	148	0.066	0.010	0.128

^{*} All MWI's in this size category switch.

TABLE 44. AIR EMISSIONS FROM NEW MWI'S UNDER REGULATORY OPTION-SCENARIO 3-A

	ton	s/yr	g/	yr	tons/yr						
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO_x	Pb	Cd	Hg	
Small Batch Nonbatch	0.033 0.352	0.122 0.334	0.309 0.850	0.007 0.020	0.028 0.078	0.256 0.704	1.21 3.32	0.003 0.007	<0.000 0.001	0.001 0.003	
Medium	0.313	2.08	0.872	0.021	0.483	4.37	20.6	0.002	< 0.000	0.018	
Large Onsite Commercial	0.978 0.883	6.49 5.86	2.73 2.46	0.065 0.059	1.51 1.37	13.7 12.3	64.5 58.2	0.006 0.005	0.001 0.001	0.056 0.051	
Total	2.56	14.9	7.22	0.172	3.47	31.3	148	0.022	0.004	0.128	

TABLE 45. AIR EMISSIONS FROM NEW MWI'S UNDER REGULATORY OPTION-SCENARIO 3-B

	ton	s/yr	g/	yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO _x	Pb	Cd	Hg
Small* Batch Nonbatch	0.019 0.053	0.018 0.050	0.046 0.128	0.001 0.003	0.004 0.012	0.038 0.106	0.181 0.498	<0.000 0.001	<0.000 <0.000	<0.000 <0.000
Medium*	0.328	0.311	0.791	0.019	0.072	0.655	3.09	0.007	0.001	0.003
Large Onsite* Commercial	1.03 0.883	0.974 5.86	2.48 2.46	0.059 0.059	0.227 1.37	2.05 12.3	9.67 58.2	0.021 0.005	0.003 0.001	0.008 0.051
Total	2.31	7.21	5.90	0.140	1.68	15.2	71.7	0.035	0.005	0.062

^{*} All MWI's in this size category switch.

TABLE 46. AIR EMISSIONS FROM NEW MWI'S UNDER REGULATORY OPTION-SCENARIO 3-C

	ton	s/yr	g/	yr			ton	s/yr		
MWI category	PM	СО	Total CDD/CDF	TEQ CDD/CDF	HCl	SO_2	NO_x	Pb	Cd	Hg
Small* Batch Nonbatch	0.128 0.352	0.122 0.334	0.309 0.850	0.007 0.020	0.028 0.078	0.256 0.704	1.21 3.32	0.003 0.007	<0.000 0.001	0.001 0.003
Medium*	2.18	2.08	5.28	0.125	0.483	4.37	20.6	0.045	0.006	0.018
Large Onsite Commercial	0.978 0.883	6.49 5.86	2.73 2.46	0.065 0.059	1.51 1.37	13.7 12.3	64.5 58.2	0.006 0.005	0.001 0.001	0.056 0.051
Total	4.53	14.9	11.6	0.276	3.47	31.3	148	0.066	0.010	0.128

^{*} All MWI's in this size category switch.

TABLE 47. SUMMARY OF THE AIR EMISSIONS FROM NEW MWI'S UNDER EACH REGULATORY OPTION FOR THE NSPS (SCENARIO A)

		Regulatory Option		
Pollutant/Units	Baseline	1	2	3
PM, ton/yr	30.4	2.95	2.95	2.56
CO, ton/yr	14.9	14.9	14.9	14.9
CDD/CDF, g/yr	46.6	11.6	7.22	7.22
TEQ CDD/CDF, g/yr	1.07	0.276	0.172	0.172
HCl, ton/yr	70.6	3.47	3.47	3.47
SO ₂ , ton/yr	31.3	31.3	31.3	31.3
NO _x , ton/yr	148	148	148	148
Pb, ton/yr	0.429	0.022	0.022	0.022
Cd, ton/yr	0.056	0.004	0.004	0.004
Hg, ton/yr	0.235	0.128	0.128	0.128

TABLE 48. SUMMARY OF THE AIR EMISSIONS FROM NEW MWI'S UNDER EACH REGULATORY OPTION FOR THE NSPS (SCENARIO B)

		Regulatory Option		
Pollutant/Units	Baseline	1	2	3
PM, ton/yr	30.4	2.31	2.31	2.31
CO, ton/yr	14.9	7.21	7.21	7.21
CDD/CDF, g/yr	46.6	5.90	5.90	5.90
TEQ CDD/CDF, g/yr	1.07	0.140	0.140	0.140
HCl, ton/yr	70.6	1.68	1.68	1.68
SO ₂ , ton/yr	31.3	15.2	15.2	15.2
NO _x , ton/yr	148	71.7	71.7	71.7
Pb, ton/yr	0.429	0.035	0.035	0.035
Cd, ton/yr	0.056	0.005	0.005	0.005
Hg, ton/yr	0.235	0.062	0.062	0.062

TABLE 49. SUMMARY OF THE AIR EMISSIONS FROM NEW MWI'S UNDER EACH REGULATORY OPTION FOR THE NSPS (SCENARIO C)

		Regulatory Option		
Pollutant/Units	Baseline	1	2	3
PM, ton/yr	30.4	4.53	4.53	4.53
CO, ton/yr	14.9	14.9	14.9	14.9
CDD/CDF, g/yr	46.6	11.6	11.6	11.6
TEQ CDD/CDF, g/yr	1.07	0.276	0.276	0.276
HCl, ton/yr	70.6	3.47	3.47	3.47
SO ₂ , ton/yr	31.3	31.3	31.3	31.3
NO _x , ton/yr	148	148	148	148
Pb, ton/yr	0.429	0.066	0.066	0.066
Cd, ton/yr	0.056	0.010	0.010	0.010
Hg, ton/yr	0.235	0.128	0.128	0.128

TABLE 50. POTENTIAL SOLID WASTE IMPACTS OF THE NSPS FOR NEW MWI'S

MWI Category	Landfill ton/yr	Lime lb/yr	CaCl ₂ lb/yr	Carbon lb/yr	PM lb/yr	Pb lb/yr	Cd lb/yr	Hg lb/yr	Total ton/yr
Small Batch Nonbatch	610 1,680	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	610 1,680
Medium	10,400	NA	NA	NA	NA	NA	NA	NA	10,400
Large Onsite Commercial	32,700 NA	NA 2,400,000	NA 2,210,000	NA 469,000	NA 175,000	NA 2,920	NA 314	NA 2,730	32,700 2,630
Total	45,400	2,400,000	2,210,000	469,000	175,000	2,920	314	2,730	48,000

NA - Not Applicable. Landfill waste is associated with onsite units that switch to alternative methods of waste disposal. Commercial units do not switch.

TABLE 51. ADDITIONAL ANNUAL BLOWDOWN VOLUME FROM HIGH EFFICIENCY WET SCRUBBERS ON NEW MWI'S AND DIFFERENCE IN ANNUAL AMOUNT OF POLLUTANTS DISCHARGED IN THE WASTEWATER

	DI I	Pollutants in wastewater						
MWI category	Blowdown, gal/yr	PM, lb/yr	Pb, lb/yr	Cd, lb/yr	Hg, lb/yr	TEQ, g/yr		
Small Batch Nonbatch	1,450,000 1,850,000	897 3,120	55 153	6 16	57 157	0.05 0.13		
Medium	NA	(30,400)	(909)	(94)	10	0		
Large Onsite Commercial	NA NA	(156,000) (141,000)	(2,850) (2,570)	(293) (265)	30 27	0 0		
Total	3,300,000	(323,000)	(6,120)	(630)	281	0.17		

 \mbox{NA} - Not Applicable. There is no increase in the baseline blowdown volumes for medium and large MWI's. Negative results displayed in parentheses

TABLE 52. ADDITIONAL ELECTRICITY USAGE FOR NEW MWI'S

MWI category	Electricity, MWh/yr
Small Batch Nonbatch	1,450 1,750
Medium	6,170
Large Onsite Commercial	280 143
Total	9,800

V. References

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- 4. Memorandum from B. Hardee, MRI, to R. Copland, EPA:ESD. May 20, 1996. Switching Scenarios for Existing Medical Waste Incinerators.
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- 9. D. Randall, MRI, with S. Grisolia, Chemical Waste Management. August, 23, 1990. Telecon: Discussion of costs to dispose of flyash from a medical waste incinerator as hazardous waste.